

RESEARCH NOTE



CENTRAL STATES FOREST EXPERIMENT STATION
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No. 0.73HARDWOOD LOG GRADING AT CIRCULAR SAWMILLS

Log grading essentially sorts logs into quality groups. Therefore, at a mill where log price is based on quality, the mill's grading system is important to the mill operator, the log supplier, and the timber owner.

Log quality estimates at five circular sawmills in southern Ohio and eastern Kentucky during the summer of 1962 varied greatly by mill graders. This variation affected the amount each mill paid for logs even when they paid the same price per thousand board foot for a given species and log grade.

Study Methods

To evaluate the grading systems used, study logs at each mill were scaled and graded by the log buyer and by a Forest Service check scaler.

The check scaler used the same log rule as the individual log buyer. At all mills the same scaling method, a modification of the method prescribed in the National Forest Scaling Handbook,^{1/} was used by the check scaler. Volume loss from scalable defect was computed using Grosenbaugh's formulas^{2/} for cull percent.

^{1/} U.S. Department of Agriculture. National Forest scaling handbook. Forest Serv. FSH 2443.71, 193 pp., illus. 1963.

^{2/} Grosenbaugh, L. R. Shortcuts for cruisers and scalers. U.S. Forest Serv. South. Forest Expt. Sta. Occas. Paper 126, 24 pp., illus. 1952.

To check a mill log buyer's quality estimates, the study logs were graded independently using the U.S. Forest Service Hardwood Log Grades^{3/} for factory lumber class logs, and the U.S. Forest Service Standard Specifications for Hardwood Construction Logs and the Suggested Specifications for Hardwood Local Use Logs^{4/} for subfactory lumber class logs.

Grading Practices

Although scaling techniques varied among the study mills, at no mill did scaled log volume differ more than 3 percent from that determined by check scale. Therefore, any variation in log quality estimates among mills was attributable primarily to differences in grading practices. Two mill operators used no formal log-grading system but did vary price according to their opinion of quality. At the other three mills formal grading systems were used. One was based on the U.S. Forest Service Hardwood Log Grades and another was based on the Ohio Forestry Association Log Grades.^{5/} The third was a special system developed by the mill operator for his own use.

At the two mills where no formal grading system was used we considered high-priced logs to be Grade 1; medium-priced logs, Grade 2; and low-priced logs, Grade 3.

All the mill graders showed bias in grading logs or estimating log value. For example, graders tended to grade logs of preferred species higher than the same quality logs of a less desired species. In addition, diameter appeared to be far more important to them than the clear log surface in determining log grade or establishing the price to be paid for a log. Mill graders did not differentiate between defects that reduce volume only and defects that degrade as well as reduce volume. As a result, the mill grades they assigned varied widely from those we assigned using the Forest Service Hardwood Log Grades (table 1).

^{3/} Forest Products Laboratory. Hardwood log grades for standard lumber. U.S. Forest Serv. FPL Rpt. 1737, 15 pp., illus. 1959.

^{4/} Ostrander, M. D., and others. A guide to hardwood log grading. U.S. Forest Serv. Northeast. Forest Expt. Sta., 50 pp., illus. 1965.

⁵ Ohio Forestry Association, Inc. Ohio standard saw log grades. 8 pp., illus. 1964.

Table 1.--Comparison of mill log grades with check
grades, by net volume

Mill	:	:	Total	Percent of net volume graded...		
	Total	:	net log			
	logs	:	volume	Lower	Same	Higher
	<u>Number</u>		<u>Board feet</u>			
A ^{1/}	94		7,345	12	75	13
B ^{2/}	90		10,430	13	68	19
C ^{1/}	404		43,701	20	59	21
D ^{3/}	337		24,441	2	54	44
E ^{2/}	239		16,929	3	47	50

^{1/} Mill using adaptation of either the U.S. Forest Service Hardwood Log Grades or the Ohio Forestry Association Log Grades.

^{2/} Mill varying price according to an estimate of quality.

^{3/} Mill grading system developed by operator for own use.

Mill operators using their own grading systems tended to overgrade logs. For example, at mills B, D, and E, 41 percent of total net log volume (51,800 board feet) was overgraded and 4 percent was undergraded--a net overgrade of 37 percent. By contrast, at mills where standard grading was employed, 20 percent of total net log volume (51,046 board feet) was overgraded and 19 percent was undergraded--a net overgrade of 1 percent.

Logs that should be classified separately as "construction," "local use" or "cull" according to specifications for subfactory lumber class logs were generally lumped together by the mill graders.

An indication of the importance of the variation in quality estimates may be obtained by assigning values to the various grades. If, for example, operators at the study mills bought a load of ten Forest Service Grade 2 logs totaling 2,050 board feet, graded them as indicated in table 1, and valued their equivalent of Forest Service Grade 1 logs at \$70.00 per thousand board feet, Grade 2 at \$50.00 per thousand board feet, and Grade 3 at \$30.00 per thousand board feet, these operators would have paid the following amounts for the load:

<u>Grader</u>	<u>Grading method</u>	<u>Value of load</u>
Check grader	U.S. Forest Service	\$102.50
Mill A	Standardized system	102.90
Mill B	Estimate of quality	104.98
Mill C	Standardized system	102.90
Mill D	Operator's own system	119.72
Mill E	Estimate of quality	121.76
All mill average		110.30

Under these conditions a log seller cannot validly compare the board-foot prices paid for logs by different mills unless he adjusts for differences in grading between mills. And the information necessary to make such adjustments is often either not available or, at best, difficult to obtain. A mill operator must make the same adjustments in order to compare his mill log grade and lumber tally with published log-grade, lumber-yield information. Standardized log grading would eliminate the need for such adjustments.

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Consumption of Roundwood Is Also Up

In 1963, when there was also a sharp increase in the use of residues, the consumption of round pulpwood dropped. In 1964, however, roundwood consumption rose about 50,000 tons or 4 percent and now amounts to 1.2 million tons (table 2).

Illinois was the only state where roundwood consumption declined in 1964. Indiana mills consumed 9 percent more wood and, as a result, Indiana replaced Illinois as the second-ranking state. The largest increase in pulpwood consumption, 25 percent, occurred in Iowa. Ohio mills still consume more than half of the Region's roundwood.

Mills are using about the same species as in previous years. In 1964, the consumption of hard hardwoods^{1/} was 780,000 tons or about three-fifths of the pulpwood used. Soft-hardwood^{2/} consumption was 460,000 tons or about two-fifths of the total. The remaining 5,000 tons, less than 1 percent of the total, were softwoods.^{3/}

Harvest of Roundwood Up 8 Percent

In 1964, 1.4 million tons of pulpwood were taken from Central States forests (table 3). This harvest, valued at about \$8 million delivered at the mill, was 8 percent more than in 1963 and only 3 percent less than the high recorded in 1962. All states except Kentucky cut more pulpwood and the decrease in Kentucky was very small. The largest change occurred in Iowa where 70 percent more pulpwood was harvested to supply expanding Iowa mills. Both Iowa and Missouri produced more pulpwood in 1964 than in any year since the beginning of this survey in 1955. But Ohio is still the leading producer. Ohio's pulpwood harvest is more than 2 1/2 times that of any other state in the Region.

The harvest of hard hardwoods increased 13 percent and these species once again included more than half of the pulpwood harvested.

^{1/} Hard hardwoods include species such as oak, hickory, hard maple, and beech.

^{2/} Soft hardwoods include species such as basswood, yellow-poplar, aspen, cottonwood, and soft maple.

^{3/} Softwoods include coniferous species--primarily pine.

Table 1.--1964 Consumption of roundwood and residues by state, and changes since 1963

State	Roundwood		Residues		Total	
	Volume	Change	Volume	Change	Volume	Change
		since 1963		since 1963		since 1963
	Tons ^{1/}	Percent	Tons ^{1/}	Percent	Tons ^{1/}	Percent
Ohio	669,835	+ 2.9	226,003	+ 43.7	895,838	+ 10.9
Illinois	189,814	- 9.4	52,772	+ 61.5	242,586	+ .1
Indiana, Iowa, and Missouri ^{2/}	385,305	+ 15.3	29,364	+ 11.3	414,669	+ 15.0
Total	1,244,954	+ 4.2	308,139	+ 42.4	1,553,093	+ 10.1

^{1/} Expressed in tons of green, unpeeled roundwood. Residue volume was converted to roundwood equivalents to arrive at comparable units of data.

^{2/} Combined to prevent disclosure of individual mill consumption.

Table 2.--1964 Round pulpwood consumption by state and species group

State	:	:	Hardwoods		:	:	Value
	Conifers	:	Hard	Soft	:	Total	delivered
	:	:			:		at mill
	<u>Tons</u>		<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	<u>Percent</u>	<u>Thousand dollars</u>
Ohio	1,750		551,632	116,453	669,835	53.8	3,687
Illinois	3,280		36,538	149,996	189,814	15.2	1,069
Indiana, Iowa, and Missouri ^{1/}	400		191,677	193,228	385,305	31.0	2,313
Total	5,430		779,847	459,677	1,244,954	100.0	7,069

^{1/} Combined to prevent disclosure of individual mill consumption.

Table 3.--1964 Harvest of round pulpwood by state and species group

State	:	:	Hardwoods		:	:	Change	:	Value
	:	Conifers	:	:	:	:	from	:	delivered
	:	:	Hard	Soft	:	:	1963	:	at mill
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		<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	<u>Tons</u>	<u>Percent</u>		<u>Percent</u>	<u>Thousand dollars</u>
Ohio		21,710	502,491	103,320	627,521	45.4	+	9.2	3,451
Illinois		22,634	63,305	158,951	244,890	17.7	+	3.5	1,361
Indiana		--	99,760	101,444	201,204	14.5	+	7.2	1,168
Iowa		200	43,995	34,470	78,665	5.7	+	69.8	478
Kentucky		97,846	66,745	13,322	177,913	12.9	-	1.1	986
Missouri		1,206	6,457	44,448	52,111	3.8	+	6.4	355
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Total		143,596	782,753	455,955	1,382,304	100.0	+	8.5	7,799

Soft-hardwood cutting decreased from 1963, but these species still included about one-third of the total cut. Illinois produced more soft-hardwood pulpwood than any other state.

The harvest of softwoods increased 43 percent. The 144,000 tons of softwood cut in 1964 represented more than 10 percent of the total pulpwood harvest and was the largest softwood volume recorded in the history of the survey. Illinois and Ohio increased their harvests of softwood but Kentucky still leads, accounting for two-thirds of the regional total. Practically all of the softwood harvested left the Central States Region for mills to the south and east.

Harvest by Counties

In 1964, pulpwood was harvested from more than 200 Central States counties--about one-third of the total number in the Region (fig. 2). Most of the cutting was done within 40 miles of a pulpmill or chipping operation, indicating that pulpwood is plentiful and easy to get. The heaviest cutting occurred in southern Ohio where six counties--Ross, Hocking, Vinton, Pike, Jackson, and Scioto--together accounted for more than one-fourth of the Region's production.

In only five counties did production change by as much as 10,000 tons since 1963 and four of these five counties showed increases (fig. 3).

Outgoing Shipments of Roundwood Still

Exceed Incoming Shipments

For the fifth consecutive year, the Central States cut more pulpwood than their mills consumed. Shipments of roundwood out of the Region increased to almost 158,000 tons. At the same time, shipments into the Region remained at about 20,000 tons.

Most of the outgoing wood was pine cut from Kentucky, Illinois, and Ohio and sent to mills in states to the south and east. Most of the incoming pulpwood was Wisconsin and Minnesota hardwood that was pulped in Iowa.

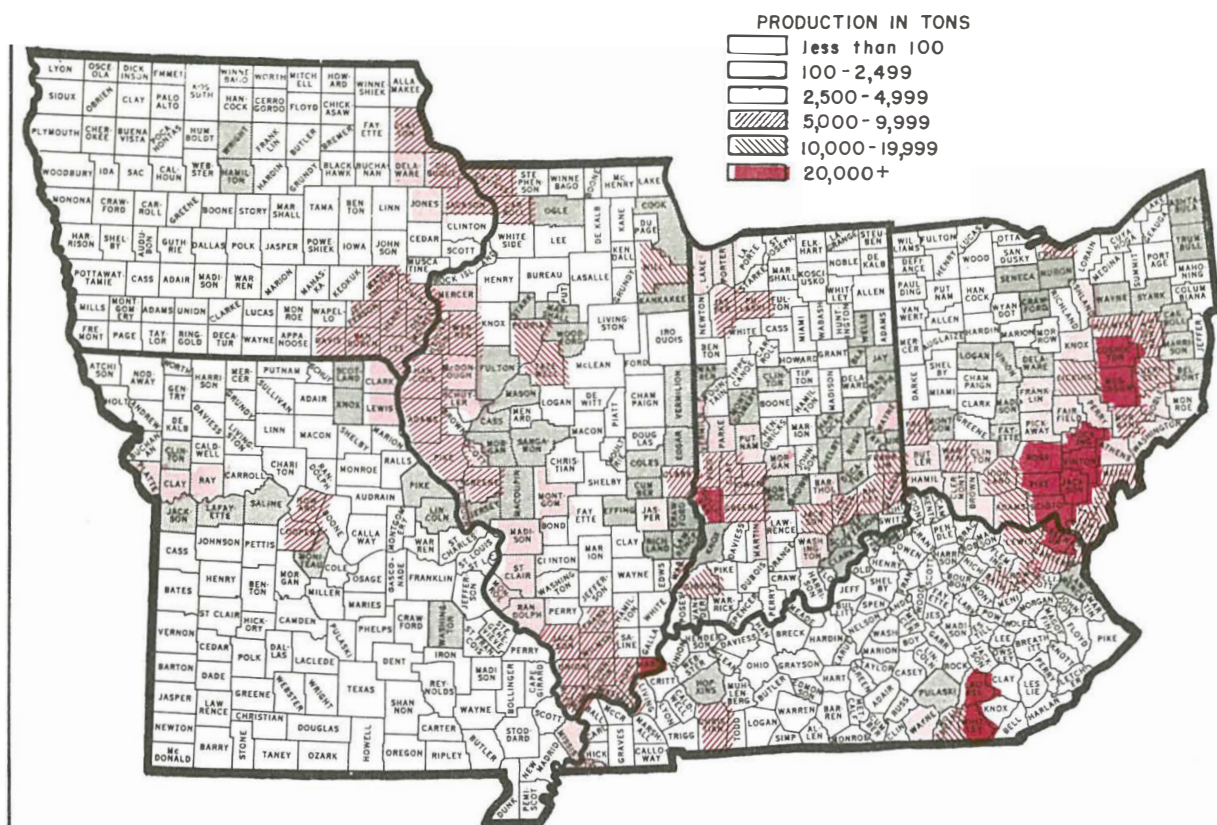


FIGURE 2.--Harvest of pulpwood by counties, 1964.

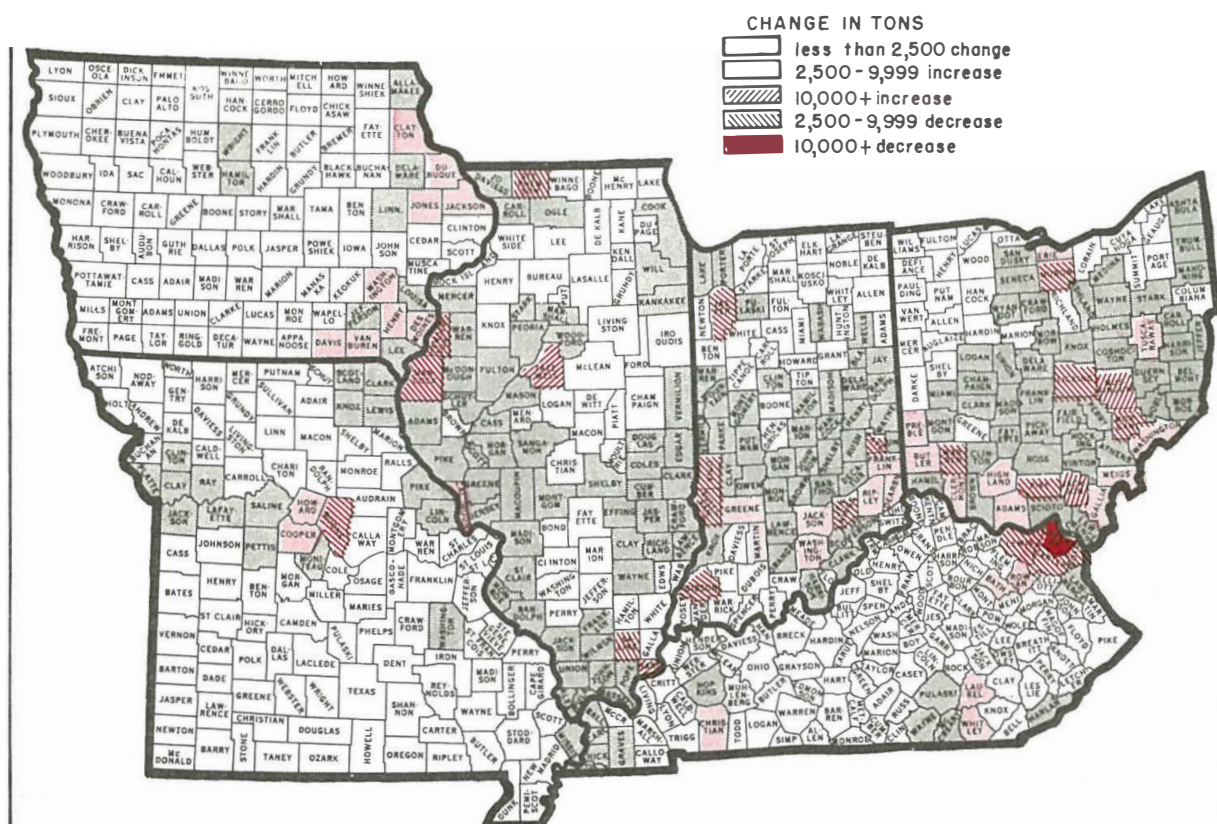


FIGURE 3.--Change in harvest of pulpwood by counties, 1963-64

During 1964, Central States mills got about 84 percent of their roundwood from their home state (fig. 4). Another 15 percent came from other Central States and the remainder, from outside the Region. Only Iowa mills still depend heavily on other states for their pulpwood.

Almost 89 percent of the pulpwood harvested from the Region was processed in the Region. More than 75 percent of the pulpwood harvested went to a mill in the same state and another 13 percent went to a mill in some other central state. The remainder went to mills outside the Region.

About two-thirds of the residues consumed by Central States mills came from outside the Region. West Virginia sawmills were the primary source.

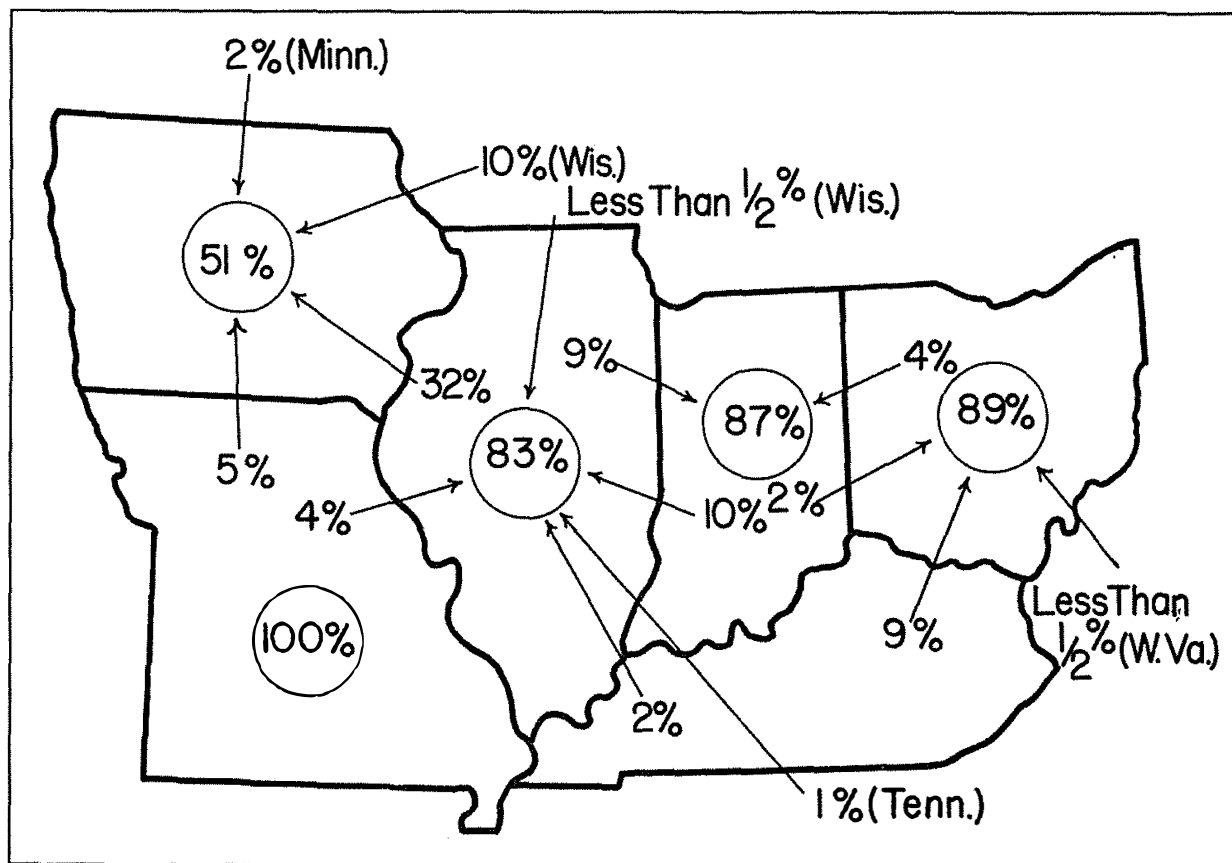


FIGURE 4.--Sources of round pulpwood consumed by Central States pulpmills, 1964. (Explanation: 87 percent of the round pulpwood consumed by Indiana mills was harvested in Indiana. The rest was shipped in from Ohio and Illinois.)

Industry Expansion Offers Opportunity For
Improving the Economy and Woodlands of the Region

The use of paper and paperboard probably will continue increase during the next few decades. The Region's pulpwood industry will probably expand to help meet this rising demand. A larger pulpwood industry will mean more jobs, and additional income for local sawmill operators, timber growers, and marketing agents. Much of the effect will be felt in economically depressed counties where unemployment is high.

Expansion could also have a favorable effect on the forests. In recent years the volume of small, low-quality hardwood timber has been increasing rapidly in the Central States. A larger market for this kind of timber would make timber stand improvement operations more profitable.

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